Continuous tracking of structures from an image sequence

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CONTINUOUS TRACKING OF STRUCTURES FROM AN IMAGE SEQUENCE
– talk –

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The talk describes an innovative method to simultaneously estimate motion and track a structure on an image sequence. To process noisy images, assumptions on dynamics should be involved. Consequently, the method relies on the dynamics equations of the studied physical system.

The issue of tracking a structure has been largely studied in the image processing literature, see Yilmaz et al. [1]. In Papadakis et al. [2], a method that computes motion field and tracks a structure, based on an incremental 4D-Var approach, is described. But it requires an accurate segmentation of the structure on the whole image sequence. On the other hand, our method only necessitates an approximate segmentation of the object on the first image. To our knowledge, no paper describes such a method that, only based on image data and a rough segmentation, simultaneously estimates motion and segments/tracks a structure.

A strong 4D-Var algorithm, such as described by Le Dimet et al. [3], is used to solve the evolution equation of image brightness, those of motion's dynamics and those of the distance map modelling the tracked structure. The observation data used by the assimilation process are the satellite images and their gradient values. The solution is obtained by minimization of a cost function using the L-BFGS algorithm, described by Zhu et al. in [4].

Promissing results have been obtained on twin experiments in order to quantify the accuracy of the method. The approach has also been tested on satellite acquisitions in order to track clouds an meteorological satellite acquisitions. Further research will concern the conception of a multi-object tracking method.

References

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